

## 2 Symptoms of Cranial Nerve Affection:

Cranial	Nerve	Symptom of Lesion
<u>I</u>	<u>Olfactory</u>	<u>Anosmia</u> – <u>Parosmia</u> . <i>dist. perception</i>
<u>II</u>	<u>Optic</u>	<u>↓ Acuity of vision</u> – <u>Field defects</u>
<u>III, IV, VI</u>	<u>Ocular Nerves</u>	<u>Diplopia</u> ( <i>direction</i> ) <i>ptosis, squint</i> <i>5</i>
<u>V</u>	<u>Trigeminal</u>	<u>Difficult mastication (motor)</u> <u>Abnormal face sensation (sensory)</u>
<u>VII</u>	<u>Facial</u>	<u>Accumulation of food behind cheek.</u>
<u>VIII</u>	<u>Cochleo-vestibular</u>	<u>↓ Acuity of hearing</u> , <u>Tinnitus (cochlear part).</u> <u>Vertigo (vestibular part).</u>
<u>IX, X, XI &amp; XII</u> ( <u>Bulbar Nerves</u> )	<u>Glossopharyngeal &amp; vagus</u> <u>Cranial accessory &amp;</u> <u>Hypoglossal</u>	<u>1- Dysphagia</u> <u>2- Dysarthria</u> <u>3- Dysphonia (hoarseness of voice)</u> <u>4- Nasal regurgitation.</u>

## 3 Symptoms of Motor System Affection: (U.M.N., L.M.N., extra Δ, cerebellum):

- Destructive lesion: weakness or paralysis. If present ask about muscle tone & wasting.
- Irritative lesion: Convulsions, fasciculations and/or abnormal movements.

## 4 Symptoms of Sensory System Affection:

- Destructive lesion: Hypoesthesia or anaesthesia.
- Irritative lesion: Pain, hyperesthesia and/or parasthesia (abnormal sensations of skin).

## 5 Symptoms of Autonomic (Sphincteric) Disturbances:

- Control of micturition & defaecation.
- Impotence (specially in cases of conus lesions, DS & diabetic PN.).

## IV. PAST HISTORY:

- Trauma:** Usually severe: in cases of paraplegia, quadriplegia, cauda lesions & coma.  
\* Mild trauma to the head might cause subdural haematoma in old alcoholics
- Fever:** specially near the onset of the disease. In cases of: Meningitis, encephalitis & myelitis.
- Diabetes Mellitus** (polyuria, polydipsia, polyphagia & weight loss): In cases of peripheral neuropathy, cranial N. palsy & impotence.
- Hypertension** (headache, tinnitus, epistaxis): In cases of hemiplegia, cerebral haemorrhage, encephalopathy.
- T.B.** (haemoptysis, symptoms of toxemia as night fever, night sweats, loss of weight, appetite & anti-TB drug intake): In cases of paraplegia (Potts), cerebellar ataxia and meningitis.
- Syphilis** (chancre, recurrent still-births, abortions): In cases of sensory ataxia (Tabes) mental deterioration with convulsions (G.P.I.).
- Rheumatic fever & R.H.D.** (arthritis, epistaxis . . .): In cases of hemiplegia & chorea.



8. **Otitis media** (ear discharge): In cases of facial palsy, brain abscess & lateral sinus thrombosis.
9. **Previous drug intake:** In cases of:
  - Cerebellar ataxia: Barbiturates, Hydantojn.
  - Convulsions: Ambilhar.
  - P.N.: Streptomycin, I.N.H., Sulphonamides.
  - Myopathy: Vincristine, Chloroquine.
  - Parkinsonism: Reserpine, Phenothiazides & other major tranquilizers.
10. **Previous similar attacks:** In cases of D.S. & T.I.A.s.

## V. **FAMILY HISTORY:** Ask about:

1. Similar conditions in the family.
2. Consanguinity between parents.

## II. **EXAMINATION**

### A. **GENERAL EXAMINATION:**

Before proceeding to the examination of the nervous system conduct a thorough general examination: General appearance, pulse, temperature, blood pressure, heart, chest & abdomen.

### B. **NEUROLOGICAL EXAMINATION:**

#### 1. **EXAMINATION OF THE MENTAL FUNCTION**

Report on:

- ① **State of consciousness:** For assessment (see p. 147).
- ② **Orientation for time & place:** Ask: "What time is it? What place is this?"
- ③ **Memory:**
  - 1- It is the ability to retain & recall informations & experiences.
  - 2- It is mainly the function of the limbic system of the temporal lobe.
  - 3- Test for:
    - a. **Immediate memory:** Tell the patient a group of digits (numbers) & ask him to repeat them. Find out the no. of digits he can repeat correctly after one hearing (e.g. 5, 9, 7, 12 ...). Normally he should recall 7 digits.
    - b. **Recent memory:** Ask the patient if he remembers some recent events e.g. "What did you have for breakfast yesterday?" & check his answers with his surrounding family.
    - c. **Remote memory:** Ask the patient if he remembers some old events e.g. "What year was the Egyptian Revolution?"
  - 4- Diminution of memory is termed **AMNESIA** which includes:
    - a. **Anterograde** amnesia: loss of memory for immediate & recent events.
    - b. **Retrograde** amnesia: loss of memory for remote events.
    - c. **Transient** global amnesia (circumscribed amnesia): sudden total loss of memory lasting for less than one day in a middle-aged healthy person, it may be precipitated by physical or emotional stress. It may be due to temporal lobe ischaemia & the condition is benign.



5- Commonest Causes of Amnesia:

1. Cerebral atherosclerosis.
2. Temporal lobe lesions.
3. Korsakow's syndrome due to chronic alcoholism (amnesia, confabulations & P.N.).
4. Dementias e.g. Alzheimer & Huntington's chorea.
5. Post-concussion.
6. Hysterical.

- 4) Mood & Affect:
- Mood is the patient's inner feelings while
  - Affect is the outward expression of emotion.

Abnormalities in Mood and Affect include:

1. Depression.
2. Euphoria.
3. Emotional lability.
4. Apathy or indifference.

The commonest causes of abnormalities of Mood & Affect are:

1. D.S.
2. Pseudo-bulbar palsy.
3. Cerebral atherosclerosis.
4. Psychosis and Neurosis.

5) Intelligence:

It is usually assessed by special "Intelligence Quotient" (I.Q.) tests. For simplicity, the patient is considered of average intelligence when he and the doctor can understand each other.

6) Behaviour:

It is the overall manner in which the patient sits, dresses, talks and cooperates with the doctor.

In case of a normal mentality report as follows:

The patient is fully conscious, well oriented for time and place, with normal memory and mood; he is cooperative and of average intelligence.

**N.B.:**

- 1- Hallucination: is a sensation without an external stimulus. It might be visual, auditory, olfactory or tactile.
- 2- Illusion: is misinterpretation of an external stimulus.
- 3- Delusion: is a false fixed belief, not correctable by reasoning and not shared by others of the patient's same culture.
- 4- Delirium: is a transient state of acute confusion (disorientation) in which there is restlessness, hyperexcitability and where the patient suffers from illusion and hallucinations. It occurs in acute infective fevers, alcoholism (delirium tremens), certain drug intoxication (belladonna, amphetamine).



## 2. EXAMINATION OF SPEECH

Notice during history taking and comment. The main speech disturbances include:

### 1. Aphasia: Inability to formulate speech. Types:

- ✓ 1) Sensory aphasia: a) Visual agnosia and alexia. b) Auditory agnosia.
- ✓ 2) Motor aphasia: a) Verbal aphasia. b) Writing aphasia (agraphia).

### 2. Dysarthria: Difficulty to articulate speech properly.

- ✓ 1. Staccato speech: in cerebellar lesions.
  - ✓ 2. Slurred speech in pyramidal and L.M.N. lesions of speech muscles.
  - ✓ 3. Monotonous speech in Parkinsonism.
- {See details in chapter on speech, Page (35)}.

## 3. EXAMINATION OF THE CRANIAL NERVES

### 1. OLFACTORY NERVE:

- Examine for the sense of smell using a familiar non-irritant substance (e.g. ground coffee).
- Each nostril is tested separately with the patient's eyes closed.

Anosmia means loss of sense of smell (see p 15).



### 2. OPTIC NERVE: Examine for:

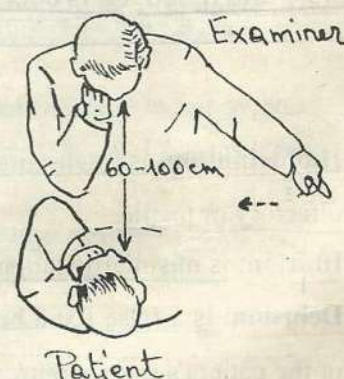
#### ① Acuity of Vision: Using Snellen's chart or finger counting from a distance of 6 meters.

- ✓ - In case of failure to count the fingers at this distance repeat at a shorter distance.
- If at a distance of 30 cm the patient still fails to count the fingers test for vision using hand movements.
- If the patient does not see the movements, test for light perception using the torch.
- If there is no P.L. then the patient is blind.
- Each eye should be examined separately.

#### ② Field of Vision:

It is examined using Bjerrum's screen (central vision) and the perimeter (peripheral vision). If these are not available use the confrontation test.

- 1- Sit in front of the patient at a distance of 60-100 cm. Keep your eyes at the level of the patient's eyes.
- 2- Let the patient close one eye and you close the opposite eye. Insist that the patient looks into your eye and nowhere else.
- 3- Examine for the field of vision of the patient's open eye by bringing your finger slowly from the periphery inwards. Test for the whole field by bringing your finger from above, below, left and right.



**N.B.:** The patient's field of vision is normal when he notices the movement of your finger at the periphery of the field at the same time that you do. Then test for the other eye in the same manner.

#### ③ Ophthalmoscopic examination for papilloedema & optic atrophy (See Brain Tumours).

#### ④ Colour of vision for colour blindness.



3, 4, 6, OCULAR NERVES:

Examine for:

① Ptosis which may be due to:

- Oculomotor nerve paralysis where the ptosis is complete and there is associated mydriasis and divergent squint.
- Sympathetic paralysis (Horner's syndrome) where the ptosis is partial and there is associated miosis, enophthalmos and anhidrosis.



	<u>Third N.</u>	<u>Sympathetic</u>
✓ <u>Degree</u>	<u>Complete</u>	<u>Partial</u>
✓ <u>Pupil</u>	<u>Dilated and fixed (Mydriatic)</u>	<u>Small (Miotic)</u>
✓ <u>Association</u>	<u>Divergent squint</u>	<u>Enophthalmos, anhidrosis</u>

\* To determine whether the ptosis is partial or complete, the action of the frontalis muscle should be abolished. Press a finger over the superior orbital margin, then ask the patient to open his eye: if he can, the ptosis is partial while if he cannot, the ptosis is complete.

- N.B.: Myasthenia gravis is the commonest cause of ptosis; however the ptosis is usually bilateral, the pupil is normal and there are other myasthenic manifestations.

② Pupils: They should be equal, round and reactive to light, and accommodation. RRR

① The light reflex: If you expose one eye to light while shading the other, normally there is constriction of the pupil of the exposed eye (direct reaction) as well as of the other eye (consensual reaction).

② The accommodation (near) reflex: When the patient is asked to follow your finger with both his eyes from a far to a near point, the following triad normally occurs:

- a) Convergence.      b) Miosis.      c) Accommodation.

③ Cilio-spinal reflex: Pinching the skin on one side of the neck results in dilatation of the ipsilateral pupil. This reflex is absent in cervical sympathetic lesions (Horner's syndrome).

③ Extra ocular movements:

- Test for the abducent nerve (supplying the lateral rectus muscle) by asking the patient to look laterally.
- Test for the trochlear nerve (supplying the superior oblique muscle) by asking the patient to look inwards & downwards.
- Test for the oculomotor nerve (supplying the superior, medial and inferior rectus and the inferior oblique muscles) by asking the patient to look in all other directions.
- These tests are done for each eye alone: If their results are normal this indicates that the ocular nerves are intact.
- Then repeat the same tests on both eyes simultaneously for conjugate movement; if normal, then the centres for conjugate movements present in the brain stem, and in the frontal and occipital lobe cortex are intact.



**4) Nystagmus:**

Ask the patient to look at your finger placed laterally, upwards then downwards, at some distance from his eyes. If nystagmus is present comment:

- 1- If it is spontaneous or on fixation.
- 2- If it has rapid and slow phases; the direction of the nystagmus is that of the rapid phase.

**5. TRIGEMINAL NERVE:** (M14-27)

TG

**a) Motor Part:**

1. Test for the power of the muscles of mastication:

- ✓ 1- **Temporalis:** Ask the patient to clench his jaws while you put your hands over the temples to palpate the muscles.
- ✓ 2- **Masseters:** The patient clenches his jaws while you palpate the contracted muscle between four fingers over its posterior border and the thumb over its anterior border.
- ✓ 3- **Pterygoids:** Ask the patient to open his mouth while you fix his head.  
 Unilateral paralysis: Deviation of the jaw to the diseased side.  
 Bilateral paralysis: No deviation, but inability to open the mouth against resistance.

deep

2. **Jaw reflex:** (afferent Cr. 5 efferent Cr. 5)

While the mouth is slightly open, place your index finger on the lower jaw, and then tap it from above downwards.

- \* Normally the reflex is absent or minimal.
- \* An exaggerated reflex, shown by closure of the jaws, denotes a bilateral U.M.N.L. above the motor nucleus of the 5th cranial nerve i.e., above the pons as in pseudobulbar palsy.

**b) Sensory Part:**

1. Test for sensations including pain (using a pin) and touch (using a piece of cotton) over the face and compare between:

- ✓ a) Both sides of the face.
- ✓ b) The ophthalmic, maxillary and mandibular division on each side.
- ✓ c) The inner and outer parts of the face.

superficial

2. **Corneal & Conjunctival reflexes** (affer.: ophth. division, Cr 5; effer. Cr 7 bilaterally):

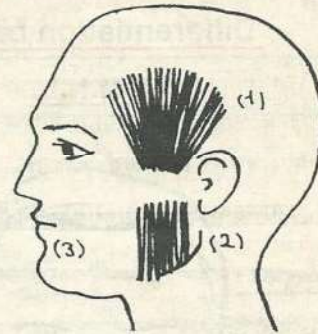
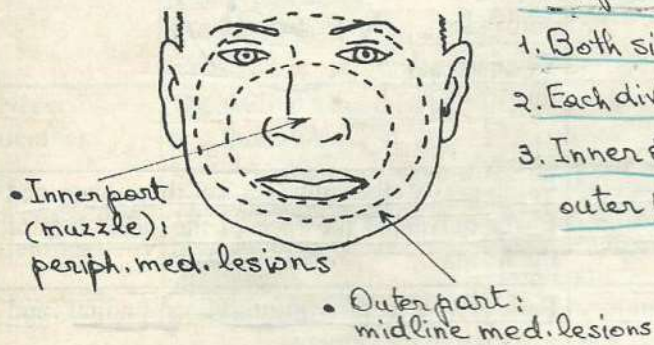
Ask the patient to look upwards and inwards. Touch the corneo-conjunctival junction from the lateral side (to avoid direct photic stimulation) using a thin piece of cotton.

- \* Normally stimulation of one eye results in blinking of both eyes.
- \* Absence of blinking on one side denotes facial paralysis of that side.
- \* Absence of blinking on both sides denotes:
  - 1- Sensory trigeminal affection of the stimulated side.
  - 2- Bilateral facial paralysis.
  - 3- Organic type of coma.

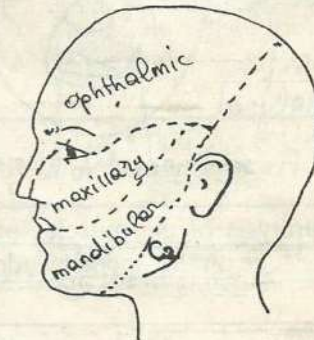
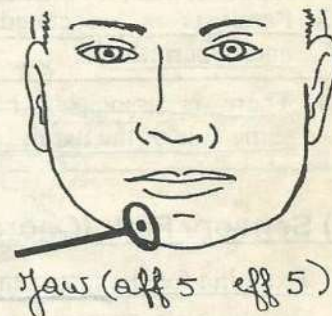
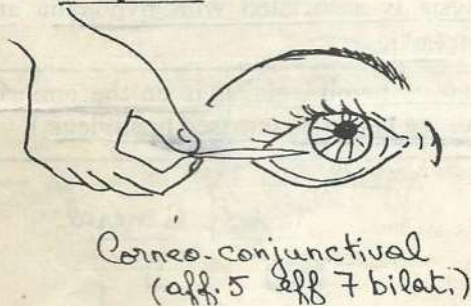


**EXAMINATION OF TRIGEMINAL NERVE****I Motor:**

- (1) Temporalis } with the jaws  
 (2) Masseter } clenched  
 (3) Pterygoids : with open mouth  
                               & fixed head.

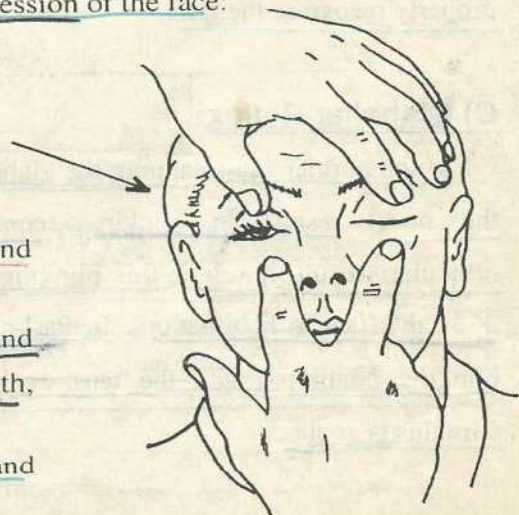
**II Sensory:**Compare:

1. Both sides
2. Each division
3. Inner & outer parts.

**III Reflex:****7. FACIAL NERVE:**

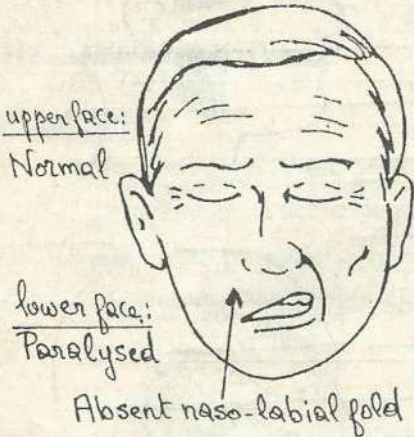
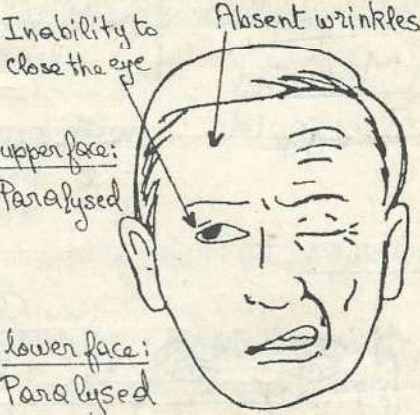
**a) Motor Part:** Examine for the muscles of expression of the face:

1. Upper face (Frontalis and orbicularis oculi):
  - ✓ - Test for raising of the eyebrows.
  - ✓ - Test for firm closure of the eye lids.  
     Bell's phenomena may be seen
2. Lower face (orbicularis oris, buccinator and retractor anguli):
  - ✓ Look for absent nasolabial fold and dropping of the angle of the mouth, present in facial paralysis.
  - ✓ Test for whistling, blowing the cheeks and showing the teeth.



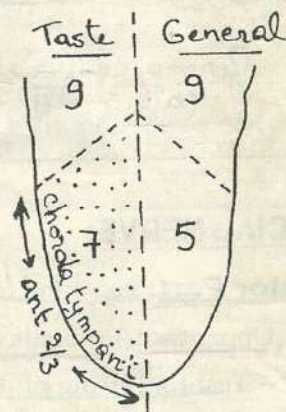


Differentiation between U.M.N. and L.M.N. facial paralysis

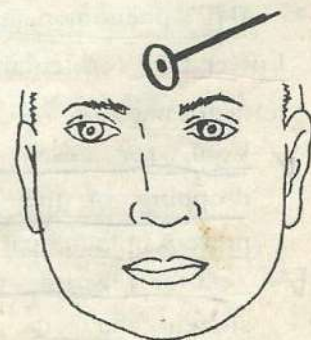
<u>U.M.N.L.</u>	<u>L.M.N.L.</u>
 <p>upper face: Normal</p> <p>lower face: Paralysed</p> <p>Absent naso-labial fold</p>	 <p>Inability to close the eye</p> <p>Absent wrinkles</p> <p>upper face: Paralysed</p> <p>lower face: Paralysed</p>
1. <u>Paralysis of the muscles of lower half of the face on the opposite side of the lesion.</u>	<u>Paralysis of the muscles of the upper and lower halves of the face of the same side of the lesion.</u>
2. <u>Paralysis involves the voluntary movement but spares the emotional and associative movements.</u>	<u>Paralysis affects voluntary, emotional and associative movements.</u>
3. <u>Paralysis is associated with hypertonia and hyperreflexia.</u>	<u>Paralysis is associated with hypotonia and hyporeflexia.</u>
4. <u>There is associated hemiplegia on the same side of the paralysis.</u>	<u>If there is hemiplegia, it is on the opposite side of the paralysis (crossed hemiplegia).</u>

**b) Sensory Part: (Chorda tympani)**

Examine for the taste sensation over the anterior two-thirds of the tongue by drying the patient's tongue and then applying a drop of sweet, bitter or salty solution on its tip. See if the patient can properly recognise the taste.

**C) Glabellar Reflex:**

In the normal adult, tapping the glabella (root of the nose) results in blinking (contraction of orbicularis oculi muscles); this blinking stops after 2-3 taps (due to habituation). In Parkinsonism the blinking continues with the taps as long as the stimulus is applied.

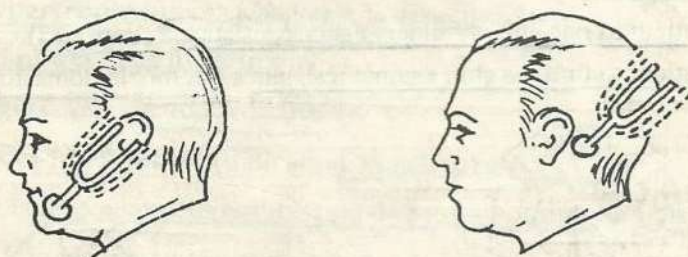
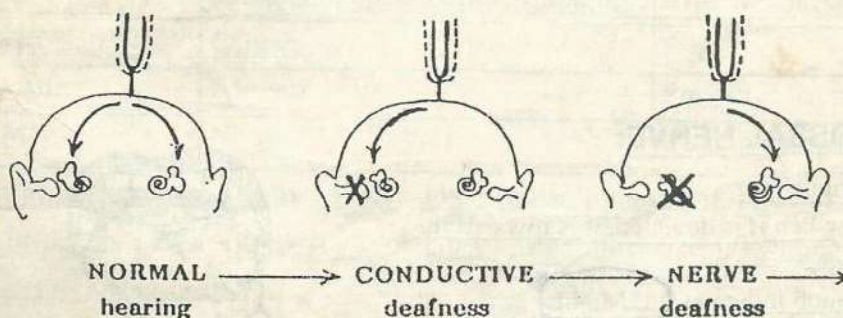




**8. COCHLEO-VESTIBULAR NERVE:****a) Cochlear Part:** Test for the acuity of hearing using:

1. The Watch test: If there is diminution of the patient's hearing do the following:
2. Rinne's test: Using the vibrating tuning fork, compare air conduction (fork placed in front of patient's ear) with bone conduction (fork placed on patient's mastoid process).
3. Weber's test: Place the tuning fork in the middle of the forehead.

	<u>Watch test</u>	<u>Rinne's test</u>	<u>Weber's test</u>
<u>Normal</u>	The acuity of the patient's hearing is similar to that of the examiner.	Air conduction is better than bone conduction.	The vibrations are heard in the middle of the forehead.
<u>Nerve deafness</u>	The patient's hearing is less than that of the examiner's.	Both air and bone conductions are diminished.	The vibrations are heard in the normal ear.
<u>Conductive deafness</u>	The patient's hearing is less than that of the examiner's.	Bone conduction is better than air conduction.	The vibrations are heard in the affected ear.

**Rinne's Test.****Weber's Test**

can elicit

**b) Vestibular Part:**

Caloric test, rotating chair tests and electronystagmography (E.N.G.).

clinically by nystagmus.



**9. GLOSSOPHARYNGEAL & 10. VAGUS NERVES:**

1. Open the patient's mouth and inspect the uvula.

Normally it is central.

If it is deviated, it is towards the healthy side.

2. **Palatal Reflex** (afferent Cr 5, efferent Cr 10).

Normally stimulation of the soft palate leads to its elevation.

3. **Pharyngeal Reflex** (afferent Cr 9, efferent Cr 10):

Use 2 tongue depressors, one to depress the tongue & the other to stimulate the pharynx, this results in local contraction & gag reflex.



← Normal



Left palatal weakness

**N.B.:**

- 1- Palatal and pharyngeal reflexes are lost in true bulbar palsy and exaggerated in pseudobulbar palsy.
- 2- Isolated lesions of the glossopharyngeal nerve are unknown; it is usually damaged with the vagus and accessory nerves at the jugular foramen.
- 3- The only specific test for isolated vagal lesion is indirect laryngoscopy to observe the position and movements of the vocal cords.

**11. ACCESSORY NERVE: (Trapezius - stimulated)**

The spinal part is tested by:

- 1- Asking the patient to raise his shoulders against resistance (trapezius).
- 2- Asking the patient to turn his chin against resistance (sternocleidomastoid).



Exam. of trapezius



Exam. of sterno-cleidomastoid

**12. HYPOGLOSSAL NERVE: (MST-20)**

- a. **Inspect the tongue for:**

1. Deviation: when it is deviated, it is towards the diseased side.
2. Wasting which indicates L.M.N.L
3. Fasciculations indicate a nuclear lesion as in M.N.D. & syringobulbia. The tongue should be inspected for fasciculations while inside the mouth.



Rt. L.M.N.  
Hypoglossal lesion



4. Abnormal movements as in Chorea.
5. Dimpling of the tongue on tapping it, in cases of myotonia.
6. Inspection may also reveal:
  - 1- Glazed tongue as in deficiency diseases.
  - 2- Fissured tongue as in mongolism.
  - 3- Ulcers as in Behcet's disease, Herpes simplex.
6. Test for the power of the muscles of the tongue by asking the patient to push the inner side of his cheek with the tip of his tongue.

#### 4. EXAMINATION OF THE MOTOR SYSTEM H60-272

##### 1. INSPECTION:

- a. The state of the muscles whether normal, wasted or hypertrophied.
  - If there is wasting describe it in details:
    - ✓ - Which limb is affected.
    - ✓ - Is it unilateral or bilateral.
    - ✓ - If bilateral, is it symmetrical or asymmetrical.
    - ✓ - Is it distal more than proximal or vice versa.
  - If there is hypertrophy report whether it is associated with:
    - 1- Increased power: true hypertrophy.
    - 2- Decreased power: pseudohypertrophy.
- b. Fasciculations or fibrillations (indicating an irritative A.H.C. lesion).
 

Fasciculation: is a spontaneous contraction of a group of muscle fibres.  
It is visible and even palpable.

Fibrillation: is a spontaneous contraction of a single muscle fibre  
It is hardly visible except in the tongue.

	<u>Physiological fasciculation</u>	<u>Pathological fasciculation</u>
1. <u>Cause</u>	Anxiety, fatigue, coffee, smoking.	Irritation of AHCs.
2. <u>Type</u>	Coarse.	Fine.
3. <u>Wasting</u>	Absent.	Present.
4. <u>EMG</u>	Normal.	Giant potentials.

- c. Involuntary movements as chorea, athetosis or tremors; if present, describe them in details i.e., are they static or kinetic, rhythmic or dysrhythmic & what increases or decreases them.
- d. Skeletal deformities (as pes cavus, hallux valgus, hallux varum . . .) and abnormal positions (as claw hand, drop foot . . .).
- e. Trophic changes (as loss of hair, brittle nails and ulcers).



**2. EXAMINATION OF THE MUSCLE TONE:**Palpation**Methods of Examination:**

- اليد اليسرى
- Passive flexion & extension of all the joints.
  - Shaking method for the wrist & ankle only.
  - Gower's method for the shoulder (as in myopathy): Place your hands in the patient's axillae & try to lift his shoulders.

**Abnormal Muscle Tone may be:**

- Decreased: Hypotonia (Flaccidity) which may be due to:
  - Lower motor neurone lesions.
  - Shock stage of acute U.M.N.L.
  - Rheumatic chorea.
  - Cerebellar lesions.
  - Posterior column lesions.
  - Hypotonic form of cerebral palsy.
- Increased: Hypertonia which may be due to:
  - Pyramidal (U.M.N.) lesion = Spasticity; the hypertonia is:
    - "Clasp-knife" where the initial resistance to movement is suddenly overcome.
  - Extrapyramidal lesions other than chorea = Rigidity; the hypertonia may be:
    - "Lead pipe" where there is a steady increase in resistance, or
    - "Cog-wheel" where the resistance is intermittent

LMNL

	<u>Spasticity</u>	<u>Rigidity</u>
<u>Site of lesion</u>	Pyramidal	Extrapyramidal
<u>Distribution</u>	<ul style="list-style-type: none"> <li>- <u>Distal &gt; proximal</u></li> <li>- <u>Flexors of U.L.</u></li> <li>- <u>Extensors of L.L. &amp; trunk</u></li> </ul>	<ul style="list-style-type: none"> <li><u>Proximal &gt; distal</u></li> <li><u>Flexors of U.L., L.L. &amp; trunk</u></li> </ul>
<u>Character</u>	<u>Clasp-knife</u>	<u>Lead pipe or cog-wheel</u>
<u>Deep reflexes</u>	<u>Hyperreflexia</u>	<u>Hyporeflexia</u>

**N.B.: Other causes of Hypertonia**

- Myotonia.
- Catatonia.
- Meningeal irritation.
- Hysterical.

Muscle power 5 grade

- ① Grade 0 ⇒ no movement at all
- 1 ⇒ Trace of contraction or flickering
- 2 ⇒ movement with Gravity only
- 3 ⇒ movement Against Gravity.
- 4 ⇒ movement Against Gravity & some resistance
- 5 ⇒ Normal strength muscle without fatigue



Perversion  
 ① Fasciculation  
 ② myotonic 467

### 3. EXAMINATION OF THE MUSCLE POWER:

The muscles are tested against resistance on condition that they are not totally paralysed i.e. the patient can actively contract them.

#### a) IN THE UPPER LIMB:

##### Shoulder (mainly C4-C5):

- \* **Adduction:** pectoralis major & minor assisted by latissimus dorsi & teres major.

Ask patient to adduct his arms against resistance; or while patient presses his hands to his waist, palpate the anterior axillar fold for the contracted pectoralis.

- \* **Abduction**

0°-150° supraspinatus

15°-90° deltoid

90°-180° trapezius

} Ask the patients to lift  
His arm straight out at  
Right angles to his side.

- \* **Flexion:** anterior fibres of deltoid; ask patient to raise his arm forwards against resistance.

- \* **Extension:** posterior fibres of deltoid; ask patient to raise his arm backwards against resistance.

- \* **Lateral rotators:** infraspinatus & teres minor.

- \* **Medial rotators:** latissimus dorsi & subscapularis.

- \* **The serratus anterior:** ask patient to push his arm forwards against resistance; paralysis of this muscle leads to winging of the scapula.



Exam. of shoulder adductors



Exam. of shoulder abductors



Exam. of elbow flexor "biceps"



Exam. of elbow flexor "brachioradialis"

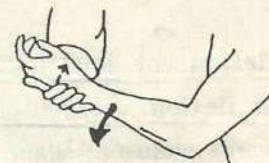
##### Elbow (C 5, 6, 7):

- \* **Flexors:** biceps, brachialis & brachioradialis.

1 - Biceps: with the patient's arm extended by his side & the hand fully supinated, ask him to flex his elbow against resistance.

2 - Brachioradialis: as for the biceps but with the hand semi-pronated.

- \* **Extensors:** triceps: with the patient's elbow flexed ask him to extend it against resistance.



Exam. of elbow extensor "triceps"

**Wrist (C 7, 8):** Test for flexion and extension against resistance while the fist is closed.

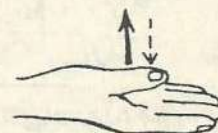
##### Hand (C 8, Th 1):

###### • Thumb:

1. **Opponens pollicis:** ask the patient to touch the tip of his little finger with the tip of his thumb.
2. **Abductor pollicis brevis:** it is the only muscle of the hand supplied by the median nerve than can be easily tested (as in carpal tunnel syndrome). Ask the patient to abduct his thumb at a right angle to the palm of the hand; the muscle can be seen and palpated.



Exam. of Opponens pollicis



Exam. of Abductor pollicis brev.



• Other fingers:

1. Abductors: Dorsal interossei; patient abducts his fingers against resistance.
2. Adductors: Palmar interossei; patient grabs a paper between 2 fingers.
3. Lumbricals: Patient puts his fingers in the writing position.



Abductors



Adductors

**b) ABDOMINAL MUSCLES:** (Th6-Th12)L are tested for specially in cases of myopathy. The patient lies down, puts his hands over his chest, then attempts to sit up.

**c) IN THE LOWER LIMB:**

Hip:

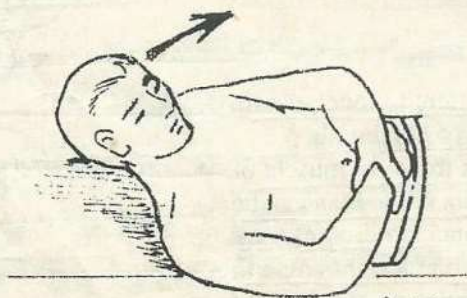
- \* Flexion: ileo-psoas (L1, 2): ask the patient to flex his hip against resistance.
- \* Extension: gluteus maximus (L5, S1,2): with the patient lying face downwards in bed, fix his trunk with your hands & ask him to raise his L.L. against resistance.
- \* Adduction: adductors longus, brevis & magnus (L2,3,4) assisted by pectineus & gracilis. Abduct the thigh & ask the patient to bring it towards the midline.
- \* Abduction: gluteus medius & minimus (L5, S1) while the thigh is in the midline, ask the patient to move it outwards.

Knee:

- \* Extension: quadriceps (L2, 3, 4): ask the patient to maintain knee extension while you try to bend the knee; or bend the patient's knee & ask him to straighten it.
- \* Flexion: hamstrings (S1, 2): ask the patient to pull his heel towards his buttock against resistance.

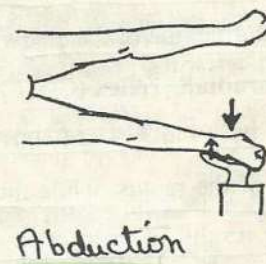
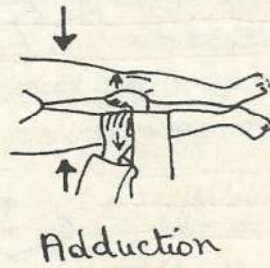
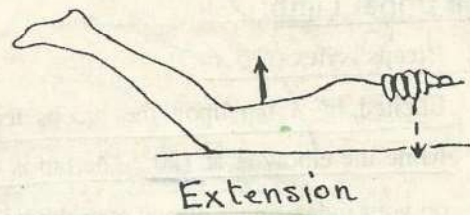
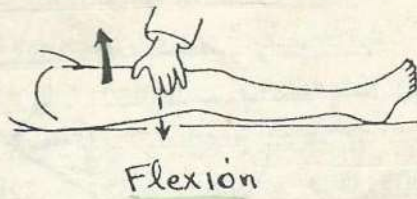
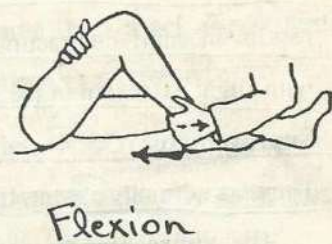
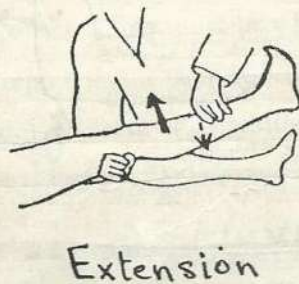
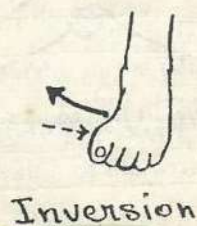
Ankle:

- \* Dorsiflexion: ant. tibial group (L4, 5).
- \* Plantar flexion: calf muscles (S1, 2): the patient moves his foot upwards & downwards against resistance.
- \* Inversion: tibialis anterior & posterior (L4).
- \* Eversion: peroneal muscles (L5): the patient inverts & everts his foot against resistance.



Exam. of Abdominal Muscles.



EXAMINATION OF THE MUSCLES OF L.L.I Hip:II Knee:III Ankle:



#### 4. EXAMINATION OF THE REFLEXES: <sup>Q117-230</sup>

##### a) DEEP REFLEXES: *Normal & pathological.*

##### In the Upper Limb: <sup>3,3</sup>

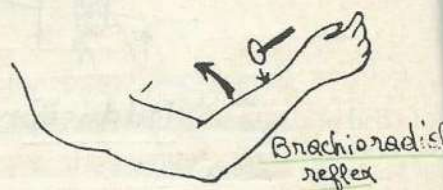
##### 1. Biceps reflex (C 5, 6):

Elicited by a tap upon the biceps tendon while the elbow is at  $120^\circ$ . The tap is done on your index finger placed over the tendon. It results in mild contraction of the biceps with slight flexion of the elbow.



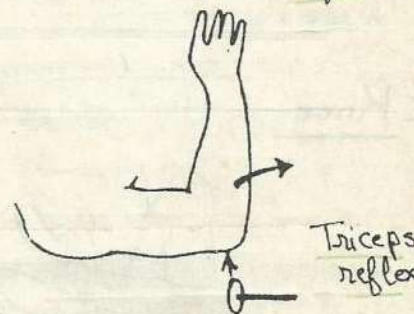
##### 2. Brachioradialis reflex (C 5, 6):

Elicited by a tap 3-4 cm above the styloid process of the radius, while the elbow is at  $120^\circ$ . It results in mild contraction of the brachioradialis and slight flexion of the elbow.



##### 3. Triceps reflex (C 6, 7):

Elicited by a tap directly on the triceps tendon while the elbow is flexed at  $90^\circ$ . It results in mild contraction of the triceps with slight extension of the elbow.



##### 4. Supraspinatus (C 3, 4) and finger (C8, T1) reflexes: <sup>3</sup> *deltoid reflex*

They are normally absent. If present, they indicate an U.M.N.L.

\* The supraspinatus reflex is done by tapping the supraspinatus muscle; in U.M.N.L. there is visible contraction of the muscle with slight abduction of the shoulder.

\* The finger reflex is done by tapping the palmar surface of the middle 3 fingers while they are slightly flexed; in U.M.N.L. there is prompt flexion of the fingers.

##### In the lower limb: <sup>2,2</sup>

##### 1. Knee reflex (L 2, 3, 4):

Elicited by a tap on the quadriceps tendon while the hip joint is slightly flexed and the knee joint is flexed and supported from beneath by your hand. It results in visible contraction of the quadriceps and extension of the knee.





2. **Ankle reflex** (S 1, 2):

Elicited by a tap on the tendon Achilles while the thigh is abducted and externally rotated, the knee is flexed at 90° and the ankle is dorsiflexed by the examiner. It results in mild contraction of the calf muscles with plantar flexion of the ankle.



Ankle reflex

3. **Patellar** (L 2, 3, 4) and **Adductor** (L 4) reflexes:

They are normally absent. If present, they indicate an U.M.N.L.

- \* The **patellar** reflex is done by pressing the upper border of the patella downwards with the examiner's index finger and then tapping the finger with the hammer; in U.M.N.L. there is contraction of the quadriceps and upward displacement of the patella.
- \* The **adductor** reflex is done by tapping the index finger placed just above the adductor tubercle, while the hip is externally rotated and slightly abducted; in U.M.N.L. there is visible contraction of the adductors with adduction of the thigh.

**N.B.:**

- \* While eliciting the deep reflexes one should observe the movement of the joint as well as that of the acting muscles which, therefore, should be bared.
- \* Don't report that a deep reflex is absent unless the patient does a **reinforcement** by clenching his teeth or clutching his hands together (Jendrassik's manoeuvre).
- \* If there is hyperreflexia, try to elicit clonus.

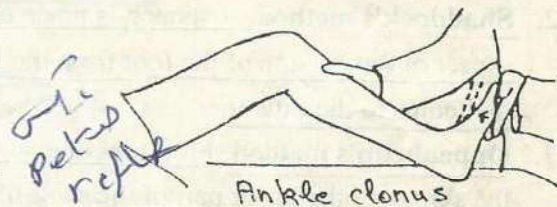
**CLONUS:** is a rhythmical series of contractions in response to the sudden sustained stretch of the tendon of the muscle. Clonus may be:

1. **Organic** denoting a definite U.M.N.L. in which case it stops with release of the stretch of the muscle.
2. **Hysterical** where it persists in spite of release of the stretch of the muscle.

\* **Ankle clonus** is obtained by passive plantar flexion of the joint followed by sudden dorsiflexion.

\* **Patellar clonus** is obtained by holding the patella and displacing it slightly upwards; this is followed by a sudden downward displacement of the patella.

\* **Wrist clonus** is obtained by sudden and sustained extension of the wrist.



Ankle clonus



Patellar clonus



**b) SUPERFICIAL REFLEXES:** (M 26-28)

They are absent in:

- 1 - U.M.N.L. above the level of the segmental supply of the reflex.
- 2 - L.M.N.L. affecting the reflex arc itself.

**1) Abdominal Reflexes (Th6 - Th12):**

- Upper abdominal reflex (Th6-10): light stroking of the skin of the abdomen above the umbilicus, from the periphery inwards, using a pin.
- Lower abdominal reflex (Th10-12): light stroking is done below the level of the umbilicus, also from the periphery inwards. In both cases, contraction of the ipsilateral abdominal muscles can be seen.



2) **Cremasteric Reflex (L1):** elicited by a stroke with a pin, along the upper part of the medial aspect of the thigh resulting in visible contraction of the cremasteric muscle.

3) **Gluteal Reflex (L4, 5):** elicited by stroking across one of the buttocks with a pin resulting in contraction of the ipsilateral gluteal muscles.

4) **Anal Reflex (S3, 4, 5):** elicited by scratching the skin of the perineal region resulting in contraction of the external anal sphincter.

**5) Plantar Reflex (S1, 2)**

Normally, stroking the sole of the foot with a blunt object results in plantar flexion of the toes. If there is dorsiflexion, with or without fanning of the toes, it denotes an U.M.N.L. However, dorsiflexion may occur physiologically in deep sleep and in infants below one year. It can be elicited by the following methods:

1. **Babinski method:** A scratch is made on the lateral aspect of the sole of the foot from the heel towards the toes.
2. **Shaddock's method:** A scratch is made on the lateral aspect of the dorsum of the foot from the lateral malleolus to the little toe.
3. **Oppenheim's method:** Firm pressure is applied on the skin over the lower part of the shaft of the tibia, from above downwards.
4. **Gordon's method:** The calf muscles are firmly squeezed. ✓
5. **Schaefer's method:** The tendon Achilles is firmly squeezed. ✓
6. **Gonda's method:** The 3rd & 4th toes are passively flexed, then suddenly released.



Shaddock's method



## EXAMINATION OF THE SENSORY SYSTEM

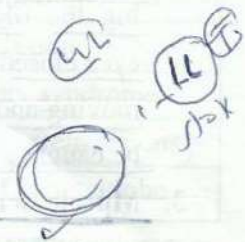
### A. SUPERFICIAL SENSATIONS including <sup>1</sup>pain, <sup>2</sup>temperature & <sup>3</sup>touch:

We examine for pain using a pin & for touch using a piece of cotton.

- ✓ 1- Compare both sides leg to leg, arm to arm & face to face.
- ✓ 2- Compare on each side, the L.L. with the trunk, with the U.L. & with the face.
- 3- In case of hyposthesia in a limb, test all around it to differentiate between radicular sensory loss & glove & stock hyposthesia.

### SENSORY SUPPLY OF THE BODY:

<u>C2</u>	Angle of jaw, lateral aspect of neck
<u>C3, 4</u>	Shoulder, down to manubrium
<u>C5</u>	Lateral aspect of arm
<u>C6</u>	Lateral aspect of forearm, thenar eminence & thumb
<u>C7</u>	Middle aspect of forearm, middle of the palm, middle 3 fingers
<u>C8</u>	Medial aspect of forearm, hypothenar eminence & little finger
<u>T1</u>	Medial aspect of arm
<u>T2-T7</u>	Thorax (T4 → nipple)
<u>T8-T12</u>	Abdomen (T10 → umbilicus) (T12 → inguinal ligament)
<u>L1</u>	Upper 1/3 front of thigh
<u>L2</u>	Middle 1/3 front of thigh
<u>L3</u>	Lower 1/3 front thigh
<u>L4</u>	Anterolateral aspect of thigh, front of knee, anteromed. aspect of leg, med. aspect of foot & big toe
<u>L5</u>	Lat. aspect of thigh, lat. aspect of leg, middle 1/3 of dorsum of foot & middle 3 toes
<u>S1</u>	Posterolateral aspect of thigh & leg, lateral 1/3 of dorsum of foot & little toe
<u>S2</u>	Posterior aspect of thigh, leg & sole of foot
<u>S3, 4, 5</u>	Anal, perianal & gluteal region (saddle shaped area) in concentric manner





### 4 B. DEEP SENSATIONS: they include:

1. Vibration sense: place the vibrating fork over the bony prominences: medial malleolus – ant. tibial tubercle – ant. superior iliac spine (A.S.I.S.) – clavicle.  
Ask the patient if he feels the fork's vibrations & if they are felt equally on all sites. If V.S. is diminished or lost over med. malleolus, check A.S.I.S.; if lost, it suggests posterior column lesion; if intact, it suggests P.N. lesion.
2. Joint sense (sense of position and movement): First show the patient, with his eyes open, the position of his big toe (dorsi-flexed, plantar-flexed); then with his eyes closed, move the big toe and ask him if he feels it moving and if so in which direction. The big toe should be caught gently, from the sides.
3. Muscle sense: by pinching the calf. The muscle sense may be normal where the patient feels a disagreeable sensation. It may be lost (Abadie's sign) as in neurosyphilis or exaggerated (tender calf). (See page 81).
4. Nerve sense: by pressing the ulnar nerve and the lateral popliteal nerve against the bones. Normally, it results in an electric-like sensation. ✓
5. Romberg's test: ask the patient to stand with the heels together, 1st with his eyes open, then with his eyes closed.  
Note any swaying or loss of balance. If present:
  - ✓ • With eyes open or closed = cerebellar ataxia.
  - ✓ • Only with closed eyes = sensory ataxia.

### 6 C. CORTICAL SENSATIONS:

They are only examined when the superf. & deep sensations are intact.

1. Tactile localisation: ask the patient to close his eyes; then prick his finger & ask him to localise the site of the prick.
2. Two-points discrimination: with the patient's eyes closed, deliver 2 simultaneous pricks, e.g. on the finger (5 mm apart) or on the legs (4 cm apart). Normally the 2 pricks are felt distinct from each other.
3. Stereognosis: with his eyes closed, the patient is asked to recognise a familiar object placed in his hand.
4. Graphosthesia: with his eyes closed, the patient is asked to recognise a number or letter drawn over his palm.
5. Perceptual rivalry: normally if you deliver 2 simultaneous pin pricks at 2 corresponding sites of the body, both pricks are felt; in cortical sensory loss, only the prick on the healthy side is felt.

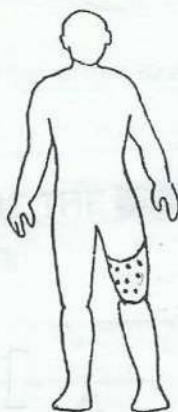


PATTERNS OF SENSORY LOSS

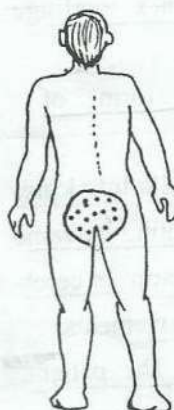
<u>Pattern of sensory loss</u>	<u>Site of lesion</u>
1. Mononeural	Peripheral nerve
2. Stock & glove ✓	Root
3. Maculo-anaesthetic (leprosy)	Conus
4. Radicular sensory loss	Unilateral cord lesion
5. Saddle area loss	Extramedullary lesion
6. Dissociated sensory loss (Brown-Sequard syndrome)	Intramedullary lesion
7. Sensory level	Lateral medullary syndrome
8. Jacket sensory loss (dissociated) ✓	Capsular & brain stem lesions
9. Crossed hemihyposthesia	Area (1, 2, 3) of parietal lobe
10. Hemihyposthesia	
11. Cortical sensory loss	



1. 2. 3.



4.



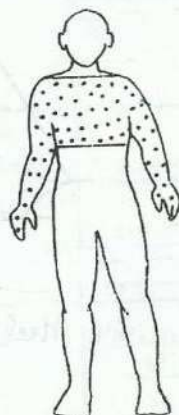
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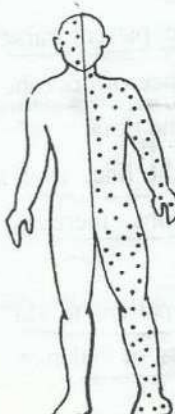
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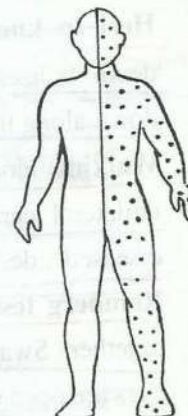
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9.



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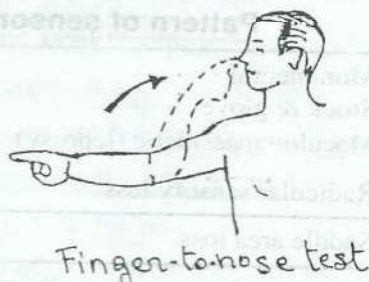
## 6. EXAMINATION OF COORDINATION

### A. IN THE UPPER LIMB: 3 finger, 3 hand, 3 leg

1. **Finger-to-nose test:** The patient brings the tip of his forefinger from a distance onto the tip of his nose. The test is conducted with the eyes open.
2. **Finger-to-finger test:** The patient brings the tip of his forefinger from a distance of his outstretched arm to meet the tip of the other hand's forefinger in the midline.
3. **Finger-to-doctor's finger test:** The patient brings the tip of his forefinger from a distance to meet the tip of the doctor's forefinger.

In any of the above tests you may find:

- a) Decomposition of movement.
  - b) Kinetic intention tremors which are evident as the patient's forefinger approaches the target.
  - c) Dysmetria in the form of Hypometria.
4. **Adiokokinesia or Dysadiokokinesia:** The patient is asked to do rapidly alternating movements of flexion and supination of the forearm. In cerebellar disease, there is failure to perform the movements.
  5. **Rebound phenomenon:** The patient's forearm is suddenly released after being flexed against resistance. The forearm may hit his face or shoulder.
  6. **Buttoning and unbuttoning test:** early



Finger-to-nose test



Adiokokinesia



Rebound phenomenon

### B. IN THE LOWER LIMB:

1. **Heel-to-knee test:** The patient raises one leg and brings the heel down onto the knee of the other leg. The heel should move down along the shaft of the tibia.
2. **Walking along a straight line:** In unilateral cerebellar lesions, there is a deviation towards the diseased side.
3. **Romberg test:** Ask the patient to stand with feet together. Swaying or loss of balance with eyes open or closed.



Heel-to-knee test.



## 7. EXAMINATION OF THE BACK AND SPINE:

Examine for:

- ✓ 1. Tenderness.
- ✓ 2. Deformity.
- ✓ 3. Hair tuft.
- ✓ 4. Swelling.
- ✓ 5. Abnormal pigmentation.

## 8. EXAMINATION OF THE CRANIUM:

Examine for:

1. Size, shape, sutures & fontanelles.
2. Bony bosses & tenderness.
3. Dilated veins, bruits & naevi.
4. McEwen's sign in brain tumours.

curved  
- severe paralysis  
- skeletal deformities  
- very thick skin  
- quads cavina → S<sub>1</sub>  
- epiconus

## 9. EXAMINATION OF THE NECK:

Examine for:

1. Signs of meningeal irritation: neck retraction - +ve Brudzinski neck sign.
2. Bruit over the neck as in carotid artery stenosis.

## 10. EXAMINATION OF THE GAIT:

If the patient can walk:

<u>Lesion</u>	<u>Cause</u>	<u>Gait</u>
1. <u>U.M.N.L. (Δ)</u> a. <u>Unilateral</u> b. <u>Bilateral</u>	<u>Hemiplegia</u> <u>Paraplegia</u>	<u>Circumduction</u> <u>Scissor</u>
2. <u>L.M.N.L</u> a. <u>Periph. Nerve</u> b. <u>Muscle</u>	<u>P.N.</u> <u>Myopathy</u>	<u>High steppage</u> <u>Waddling</u>
3. <u>Post. column</u>	<u>S.C.D. &amp; tabes dorsalis</u>	<u>Stamping</u> <u>"Strike forcibly the ground"</u>
4. <u>Cerebellum</u> a. <u>Archicerebellum</u> b. <u>Neocerebellum</u> • <u>Unilateral</u> • <u>Bilateral</u>	<u>Friedreich's ataxia</u> <u>Cerebellar astrocytoma</u> <u>Marie's ataxia</u>	<u>Wide base "drunken"</u> <u>Deviation to one side</u> <u>Zigzag</u>
<u>Extra Δ</u>	<u>Parkinsonism:</u> <u>Mild</u> <u>Severe</u> <u>Chorea</u>	<u>Short steppage</u> <u>Shuffling or festinant</u> <u>Dancing</u>
<u>Hysterical</u>	<u>Neurosis</u>	<u>Astasia Abasia</u>

Ahmed

to normal Reflex